REMARKS

Claims 1-21 are pending in this application. Claim 8 is independent. Claims 1-7 are withdrawn from consideration pursuant to a restriction requirement.

The present invention is directed to high-cleanliness steel having high fatigue strength and high cold workability. This is achieved by controlling the total-Li content of the steel to a specified range, by, e.g., adding a Li-containing substance (such as Si-Li alloy or Li_2CO_3) to molten steel, in order to limit the number of oxide inclusion particles having a major diameter of 20 μm or above in the steel. Specification at [0001], [0012], [0018], [0021].

Claims 8-21 are rejected under 35 U.S.C. 103(a) over JP63-140068 ("JP-068") in view of JP2002-167647 ("JP-647"), JP2002-194497 ("JP-497") and JP2003-027184 ("JP-184").

JP-068 fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass". The Final Rejection at page 3, lines 19-20, admits that "JP '068 **does not teach** the **presence of lithium** or limiting inclusions to less than 20 μm using a 50 gram sample." (Emphasis added).

The secondary references fail to remedy the deficiencies of JP-068.

JP-647 discloses a steel containing inclusions containing 0.5 to 10% R_2O, where R is Na, K and Li. English-language machine translation of JP-647 at page 1.

JP-497 discloses steel produced by performing slag refining, the slag containing 10% or less of at least one of Na_2O, K_2O, Li_2O and ZrO_2. English-language machine translation of JP-497 at page 1.

JP-184 is silent about Li. JP-184 discloses that a total number of zirconia inclusions having ≥ 20 μm major axis is ≤ 1 per 50 g of wire rod. English-language machine translation of JP-184 at abstract.

The Final Rejection asserts:

> While **JP '647** does not specifically provide the end Li concentration in the steel in ppm, one would reasonable expect a concentration overlapping the claimed range as **the inclusion Li_2O content is in the range claimed in dependent claims 10 and 13**. Final Rejection at page 5, lines 19-21 (emphasis added).
>
> The technical reasoning used to assert that the prior art has the claimed Li content is the a function of the **lithium content bound in the inclusions**. The **amount of inclusions** can be determined by one of ordinary skill in the art based on analysis of the prior art processing methods. Thus while **JP '647** does not specifically provide the end Li concentration in the steel in ppm, one would reasonable expect a concentration overlapping the claimed range as **the inclusion Li_2O content is in the range claimed in dependent claims 10 and 13**. Final Rejection at page 8, lines 16-22 (emphasis added).

Claim 10 reads as follows:

> 10. The high-cleanliness steel according to claim 8, wherein each of ***the* oxide inclusion particles** has a CaO content between 15 and 55% by mass, a SiO_2 content between 20 and 70% by mass, an Al_2O_3 content of 35% by mass or below, a MgO content of 20% by mass or below and a Li_2O content between 0.5 and 20% by mass.

Claim 13 reads as follows:

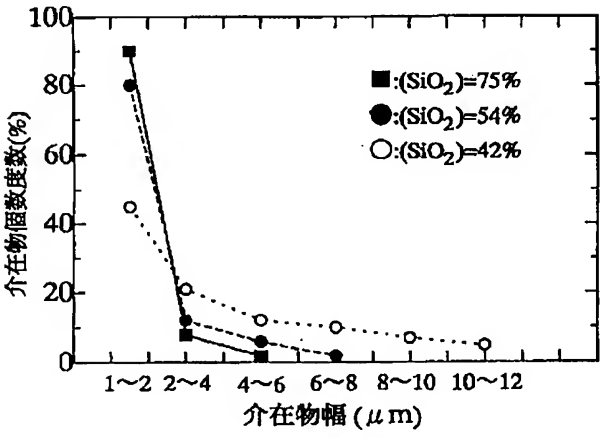
> 13. The high-cleanliness steel according to claim 10, wherein each of ***the* oxide inclusion particles** contains Na_2O and/or K_2O and the sum of Li_2O content, Na_2O content and K_2O content is between 0.5 and 20% by mass.

Independent Claim 8, from which Claims 10 and 13 depend, recites a "high-cleanliness steel ... containing 1.0 or below of **oxide inclusion particles** having a major diameter of 20 μm or above in 50 g of the steel".

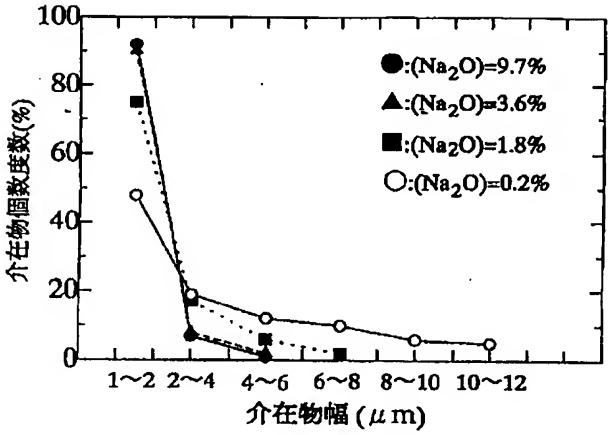
Thus, the "**oxide inclusion particles**" featured in Claims 10 and 13 are "oxide inclusion particles having a major diameter of **20 μm or above**".

JP-647 is directed towards decreasing the maximum width (size) of inclusions to **below 10 μm** by increasing the amount of SiO_2 in inclusions from 42 to 75 mass%, or by increasing the amount of R_2O (R is Na, K Li) in inclusions from 0.2 to 9.7 mass%. English-language machine translation of JP-647 at [0023]; Drawings 6-7 (reproduced below).

[Drawing 6]



[Drawing 7]



Contrary to the Final Rejection, JP-647's inclusion Li_2O content in the range claimed in Claims 10 and 13 would **NOT** reasonably lead the skilled artisan to expect a concentration of Li in steel to overlap independent Claim 1's "total-Li content between 0.020 and 9 ppm", at least because JP-647 does not suggest inclusion particles that feature both (i) the inclusion Li_2O content of Claims 10 and 13 and (ii) the "major diameter of 20 μm or above" of the "oxide inclusion particles" of Claims 10 and 13.

Furthermore, while JP-647 discloses a concentration of R_2O (R is Na, K Li) **in inclusions**, and discloses the frequency distribution of the width of inclusions (i.e., % of inclusions having each inclusion width), JP-647 is silent about the concentration of the inclusions **in the steel**. Without knowing the concentration of inclusions containing Li_2O in steel, the skilled artisan cannot calculate the concentration of Li in the steel from a knowledge of the concentration of Li_2O in the inclusions. To calculate the concentration of Li in steel from the concentration of Li_2O in inclusions, the skilled artisan must be provided with the concentration of inclusions in the steel, a concentration that JP-647 fails to suggest.

Thus, JP-647 fails to suggest the independent Claim 1 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass".

As discussed above, the Final Rejection at page 3, lines 19-20, admits that "JP '068 does not teach the presence of lithium".

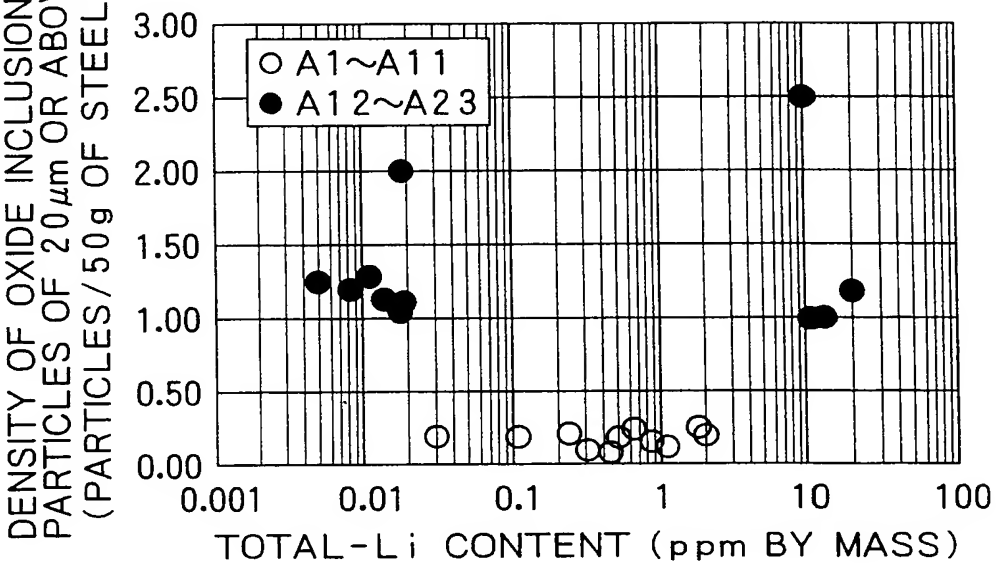
JP-497 is silent about the concentration of Li in steel.

As discussed about, JP-184 is silent about Li.

Thus, the cited prior art fails to suggest the independent Claim 1 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass". As a result, the rejection under 35 U.S.C. 103(a) should be withdrawn.

Any *prima facie* case of obviousness based on the cited prior art is rebutted by the significant reduction in density of oxide inclusion particles of 20 μm or above (particles/50g of steel) that is achieved by the present invention over the independent Claim 8 range of "a total-Li content between 0.020 and 9 ppm by mass" and over the Claim 21 range of "a total-Li content between 0.020 and 6 ppm by mass". This is demonstrated in the specification at Fig. 1, reproduced below:

FIG. 1



The data used to prepare Fig. 1 is found in the Declaration Under 37 CFR 1.132 filed September 26, 2008.

The Final Rejection asserts:

> In Fig. 1 there is no comparison of the closest prior art to establish superiority in harmful inclusion content. Final Rejection at page 9, lines 15-16.

However, the closest prior art is JP-068, the primary reference.

As discussed above, the Final Rejection at page 3, lines 19-20, admits that "JP '068 does not teach the presence of lithium".

Because the closest prior art of JP-068 does not contain Li, data for JP-068 (0 ppm Li) would not appear on Fig. 1 (where the total-Li content ranges from 0.001 to 100 ppm). Furthermore, because JP-068 does not contain Li, no comparative data showing how JP-068 varies with Li can be plotted on Fig. 1.

Thus, in Fig. 1 no comparison with the closest prior art, JP-068, is possible.

Thus, the superior effect achieved by the present invention with independent Claim 8's "steel having a total-Li content between 0.020 and 9 ppm by mass" is established over the closest prior art.

The cited prior art is silent about the significant reduction in density of oxide inclusion particles of 20 μm or above (particles/50g of steel) that is achieved by the present invention over the independent Claim 8 range of "a total-Li content between 0.020 and 9 ppm by mass" and over the Claim 21 range of "a total-Li content between 0.020 and 6 ppm by mass". The reduction in density of these oxide inclusion particles over these ranges of total-Li content provides the steel with improved cold workability and fatigue characteristics. There is no recognition in the cited prior art that controlling the total-Li content of steel controls the number of large oxide inclusion particles of diameter 20 μm or above.

Thus, any *prima facie* case of obviousness based on the cited prior art is rebutted.

Because the cited prior art fails to suggest all the limitations of independent Claim 8, and any *prima facie* case of obviousness based on the cited prior art is rebutted, the rejection under 35 U.S.C. 103(a) should be withdrawn.

Pursuant to MPEP 821.04(b), after independent product Claim 8 is allowed, Applicants respectfully request rejoinder, examination and allowance of withdrawn method Claims 1-7, which include all of the limitations of product Claim 8.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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